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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/809,295	03/16/2001	Junichiro Yoshioka	2001-0322A	5431

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EXAMINER	
MUTSCHLER, BRIAN L	
ART UNIT	**PAPER NUMBER**
1753	

DATE MAILED: 05/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

CP

Office Action Summary	Application No.	Applicant(s)	
	09/809,295	YOSHIOKA ET AL.	
	Examiner	Art Unit	
	Brian L. Mutschler	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,82 and 83* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,82 and 83* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 12, 2004, has been entered.

Comments

2. The rejection of claims 1-3 and 82-84 under 35 U.S.C. 103 has been overcome by Applicant's amendment to include the control unit, which is not taught in the combination of Sakaki, Woodruff et al., and Belongia et al.

Claim Objections

3. Claim 82 is objected to because of the following informalities:

   a. In claim 82 at line 11, please insert --in-- or --provided in-- after the phrase "a deaerating unit".

   Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 82 and 83 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 82 recites the limitation "the substrate" in lines 3 and 4. There is insufficient antecedent basis for this limitation in the claims. It is suggested that the phrase "holding a substrate position" in lines 2-3 be changed to --holding a substrate in a substrate position-- as previously presented. The same applies to dependent claim 83.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1 and 82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaki (U.S. Pat. No. 6,454,918) in view of Woodruff et al. (U.S. Pat. No. 6,309,524) and in view of Ohmi et al. (U.S. Pat. No. 6,258,244).

Regarding claims 1 and 82, Sakaki discloses a cup-type plating apparatus for plating wafers comprising a plating tank **1** for holding a plating liquid, an anode **8** immersed in the plating liquid, and a diaphragm **12** separating the anode **8** from the wafer substrate **3** (fig. 1; col. 7, lines 1-58). The apparatus further comprises separate

plating liquid circulating systems comprising a main solution tank **21** that provides the plating liquid to the substrate and an auxiliary tank **22** providing plating liquid to the chamber containing the anode **8** (fig. 4; col. 7, line 59 to col. 8, line 34). The wafer **3** is placed over the opening at the top of the plating tank **1** and is attached to a wafer support **2** capable of holding a substrate at a substrate position and comprising a cathode (not shown) and a seal packing **5** for preventing leakage of the plating solution beyond the front surface of the wafer **3** (fig. 1; col. 7, lines 1-7).

Sakaki further teaches, "Existence of gases [evolved from the anode] is undesirable as they influence the current density" (col. 3, line 62 to col. 4, line 5). Sakaki also discloses, "adjustment of the plating solution due to consumption of additives will become easier" by the use of separate circulation systems (col. 4, lines 6-18).

The apparatus of Sakaki differs from the instant invention because Sakaki does not disclose the following:

a. The substrate holder is capable of opening and closing, as recited in claims 1 and 82.

b. A deaerating unit provided in at least one of the plating liquid circulating systems, as recited in claims 1 and 82.

c. The deaerating unit comprises a deaerating membrane and a vacuum pump, as recited in claims 1 and 82.

Regarding claims 1 and 82, Woodruff et al. disclose a cup-type plating apparatus for plating wafers comprising a plating tank, an anode immersed in plating liquid, and a

substrate holder (fig. 1). In one embodiment, the substrate holder (reactor head) **30** comprises an outer body assembly **625** having an upturned lip **730** positioned on the front of the substrate **25**, which forms a seal to protect the contact **610** by forming a barrier to the electroplating environment (fig. 18; col. 13, lines 30-39). The substrate holder **30** is mounted on a lift/rotate apparatus **80** for rotating and positioning the substrate **25** for plating (col. 6, line 60 to col. 7, line 10). The positioning of the substrate **25** by the substrate holder **30** therefore opens and closes the top of the plating apparatus.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the substrate support of Sakaki to use a substrate holder as taught by Woodruff et al. because the substrate holder of Woodruff et al. automates the positioning of the substrate by using a lift/rotate apparatus, which would make the process more efficient.

Further regarding claims 1 and 82, Ohmi et al. disclose a method and apparatus for degassing a solution used in a chemical reaction, such as electrochemical reactions and metal plating (col. 1, lines 5-28; col. 3, lines 10-50). The apparatus of Ohmi et al. comprises a reaction vessel **300** and a deaerating module **401**, which comprises a membrane **804**, which permits the passage of gases, and a vacuum pump **400** (col. 5, line 36 to col. 8, line 9). The deaerating module **401** is controlled to provide a gas concentration of not more than 100 ppb (col. 13, lines 19-37).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the apparatus of Sakaki to use a deaerating unit as taught by Ohmi et al. because Sakaki teaches that the existence of evolved gases is undesirable and the deaerating unit of Ohmi et al. is an efficient means for removing such undesirable gases.

It is noted that the controller recited in claims 1 and 82 is "operatable to control a rotational speed of said vacuum pump to regulate the pressure on a decompressed side of said deaerating unit so as to maintain a concentration of dissolved oxygen in the plating liquid between 1μg/l (1ppb) and 4 mg/l (4ppm)." The structural limitations required by this limitation include a controller that is capable of controlling the operation of the vacuum pump in a manner that maintains a desired gas concentration. The deaerating unit of Ohmi et al., which comprises a membrane and a vacuum pump, is controlled to maintain the gas concentration of the chemical solution. As described by Ohmi et al., the deaerating unit operates by applying a vacuum to draw gas from the solution though the membrane. Since the deaeration of the solution relies upon the pressure produced by the vacuum pump, one skilled in the art would realize that the control of such a deaerating unit requires control of the vacuum pump.

8. Claims 2 and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaki (U.S. Pat. No. 6,454,918) in view of Woodruff et al. (U.S. Pat. No. 6,309,524) and in view of Ohmi et al. (U.S. Pat. No. 6,258,244), as applied above to claims 1 and 82, and further in view of Uzoh et al. (U.S. Pat. No. 6,113,769).

Sakaki, Woodruff et al. and Ohmi et al. describe an apparatus having the limitations recited in claims 1 and 82 of the instant invention, as explained above in section 7.

The apparatus described by Sakaki, Woodruff et al. and Ohmi et al. differs from the instant invention because they do not disclose the use of a monitoring unit for monitoring the concentration of dissolved oxygen, as recited in claims 2 and 83.

Uzoh et al. discloses an apparatus for monitoring and controlling the plating baths to control the plating uniformity in process using electronic packages or silicon wafers for substrates (col. 3, lines 31-55). The apparatus comprises at least one sensor or monitor **31** for sensing and monitoring conditions in the plating liquid, wherein the sensor **31** can be an oxygen sensor "to monitor dissolved and/or non-dissolved oxygen content" (col. 4, lines 27-51).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the apparatus described by Sakaki, Woodruff et al. and Ohmi et al. to use a monitoring unit for detecting the amount of dissolved or non-dissolved oxygen in the plating solution as taught by Uzoh et al. because monitoring and controlling the plating solution can improve the plating uniformity by maintaining consistent plating solution concentrations.

Response to Arguments

9. Applicant's arguments with respect to claims 1, 2, 82, and 83 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (571) 272-1341. The examiner can normally be reached on Monday-Friday from 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

blm
May 14, 2004

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